PATENT ABSTRACTS OF JAPAN

(11)Publication number : 08-336200

(43)Date of publication of application : 17.12.1996

(51)Int.Cl.	H04S 7/00
	G06F 17/00
	G10K 15/00
	H04S 1/00

(21)Application number : 07-139490

(22)Date of filing : 06.06.1995

(71)Applicant : MATSUSHITA ELECTRIC IND CO LTD

(72)Inventor : HAIRI TOSHIKI
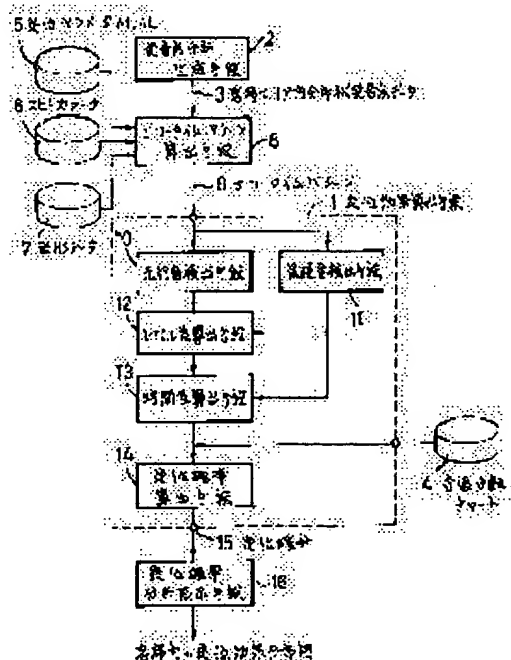IIDA KAZUHIRO

(54) SOUND IMAGE LOCALIZATION SIMULATION DEVICE

(57)Abstract:

PURPOSE: To estimate the effect of localization at the stage of designing a sound image localization system.

CONSTITUTION: Sound receiving points are set in a distribution shape within the audience seat area of a sound field by a sound receiving point distribution generation means. From a localization parameter 5, speaker data 6, room shape data 7, the echo time pattern 9 for which the localization parameter 5 at each of the sound receiving points is taken into account is calculated by an echo time pattern calculation means 8. Next, after preceding sound is detected by a preceding sound detection means 10, whether preceding sound is the sound from a localization speaker or not is decided and succeeding sound is detected by a succeeding sound detection means 11, the level difference between preceding sound and succeeding sound, and the time difference between preceding sound and succeeding sound are calculated by a level difference calculation means 12 and a time difference calculation means 13, respectively. The sound image separation chart 4 determined by an acoustic psychological experiment is preliminarily applied to the information on the time difference and the level difference, the probability that the sound image is not separated in the direction of

the localization speaker and is localized is calculated by a localization probability calculation means 14 and a color area map display of the distribution of the localization probability is performed.

LEGAL STATUS

[Date of request for examination]	16.02.2000
[Date of sending the examiner's decision of rejection]	
[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]	
[Date of final disposal for application]	
[Patent number]	3380088
[Date of registration]	13.12.2002
[Number of appeal against examiner's decision of rejection]	
[Date of requesting appeal against examiner's decision of rejection]	
[Date of extinction of right]	

:   19 i   1 j   g   j   PA1   e   1   e ail mai   AAA Jai 5DA408336200P1   m   7 8 04

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] This invention relates to the image normal position simulation equipment for
predicting the engine performance of the image normal position system in a music hall, a theater, etc. by the
design stage.
[0002]
[Description of the Prior Art] Drawing 10 is the outline block diagram showing the image normal position
effectiveness prediction approach about the engine-performance check in the design stage of the conventional
image normal position system. Normal position parameters [in / in 101 / one normal position pattern], such
as the Dele Ito value and an attenuation value, The loudspeaker data whose 102 is data, such as an output of
each loudspeaker of an image normal position system, and directional characteristics, The ** form data whose
103 is data, such as an indoor form and an ingredient of a wall surface, and 104 an echo time pattern
calculation means and 105 Based on the normal position parameter 101, the loudspeaker data 102, and the **
form data 103 The echo time pattern in consideration of the normal position parameter 101 computed by the
echo time pattern calculation means 104, 106 shows a precedence sound loudspeaker judging means, and
judges whether the sound from the normal position loudspeaker which is a requirement for making it orientate
in the direction of a normal position loudspeaker with the precedence sound loudspeaker judging means 106
based on an echo time pattern 105 is a precedence sound.
[0003]
[Problem(s) to be Solved by the Invention] However, when making a normal position loudspeaker orientate
certainly, the time lag of the consecutiveness sound to a precedence sound and the information on a level
difference are indispensable. Only by the judgment of whether the sound from the normal position
loudspeaker which is a requirement for making it orientate in the direction of a normal position loudspeaker
like the approach shown in drawing 10 is a precedence sound It is inadequate for the judgment of whether to
orientate in the direction of a normal position loudspeaker, and it cannot be understood whether it orientates
certainly and it cannot quantify effectiveness of the normal position by what probability to orientate further.
[0004] Moreover, in the conventional example, it had the trouble that the normal position effectiveness in
[whole] seat-for-audience area could not be grasped in the shape of distribution only by judging whether the
sound from a normal position loudspeaker is a precedence sound in each sound reception point.
[0005] This invention solves the above-mentioned conventional trouble, and has sufficient judgment precision
of whether to orientate to a normal position loudspeaker, and quantifies the effectiveness of the normal
position by what probability to orientate, and offers the outstanding image normal position simulation
equipment which can display the normal position effectiveness in seat-for-audience area in the shape of
distribution.
[0006]

[Means for Solving the Problem] A sound reception point distribution generation means to set up a sound reception point in the shape of distribution in the seat-for-audience area of sound field in order that this invention may attain the above-mentioned purpose, An echo time pattern calculation means to compute the echo time pattern with which said normal position parameter in each of that sound reception point was taken into consideration from a normal position parameter, loudspeaker data, and ** form data, A precedence sound detection means by which said precedence sound judges whether it is a sound from a normal position loudspeaker while detecting a precedence sound, A consecutiveness sound detection means to detect a consecutiveness sound, and a level difference calculation means to compute the level difference between said precedence sounds and consecutiveness sounds, The image separation chart for which it asked by sound mental experiment beforehand is applied to the information on a time difference calculation means to compute the time difference between said precedence sounds and consecutiveness sounds, and time difference and a level difference. A normal position probability calculation means to compute the probability orientated without an image's dissociating in the direction of a normal position loudspeaker, It has a normal position probability-distribution display means to display distribution of a normal position probability using the value of the normal position probability computed in the shape of distribution in the seat-for-audience area of sound field, and is characterized by indicating a color area map display or the ****** probability curve by the contour.
[0007]
[Function] Therefore, a sound reception point distribution generation means to set up a sound reception point in the shape of distribution in the seat-for-audience area of sound field according to this invention, An echo time pattern calculation means to compute the echo time pattern with which said normal position parameter in each sound reception point was taken into consideration based on a normal position parameter, loudspeaker data, and ** form data, A precedence sound detection means by which a precedence sound judges whether it is a sound from a normal position loudspeaker while detecting a precedence sound, A consecutiveness sound detection means to detect a consecutiveness sound, and a level difference calculation means to compute the level difference between a precedence sound and a consecutiveness sound, A normal position probability calculation means to compute the probability orientated without an image's separating into the information on the level difference of a time difference calculation means to compute the time difference between a precedence sound and a consecutiveness sound, and time difference, in the direction of a normal position loudspeaker with the application of the image separation chart for which it asked by sound mental experiment beforehand, It has a normal position probability-distribution display means to display distribution of a normal position probability using the value of the normal position probability computed in the shape of distribution in the seat-for-audience area of sound field, and the effectiveness of the normal position in a seat for audience can predict a color area map display or a ****** probability curve by indicating by the contour.
[0008]
[Example] Hereafter, the example of this invention is explained, referring to a drawing.
[0009] Drawing 1 is the outline block diagram showing the 1st example of this invention. The seat-for-audience area internal division blanket-like sound reception point data with which the normal position effectiveness calculation means and 2 are outputted from a sound reception point distribution generation means, and 3 is outputted for 1 from the sound reception point distribution generation means 2 in drawing 1 , 4 a normal position parameter and 6 for an image separation chart and 5 Loudspeaker data, The echo time pattern in each sound reception point that 7 is [an echo time pattern calculation means and 9] the outputs of the echo time pattern calculation means 8 as for ** form data and 8, 10 a consecutiveness sound detection means and 12 for a precedence sound detection means and 11 A level difference calculation means, The normal position probability in each sound reception point that 13 is [a normal position probability calculation means and 15] the outputs of the normal position probability calculation means 14 as for a time difference calculation means and 14, and 16 show a normal position probability-distribution display means to display

distribution of a normal position probability using the value of the normal position probability 15 in each sound reception point.

[0010] A precedence sound detection means 10 by which a precedence sound judges whether it is a sound from a normal position loudspeaker while the normal position effectiveness calculation means 1 detects a precedence sound, A consecutiveness sound detection means 11 to detect a consecutiveness sound, and a level difference calculation means 12 to compute the level difference between a precedence sound and a consecutiveness sound, It consists of normal position probability calculation means 14 to compute the probability orientated without an image's separating into the information on a time difference calculation means 13 to compute the time difference between a precedence sound and a consecutiveness sound, and time difference and a level difference, in the direction of a normal position loudspeaker with the application of the image separation chart for which it asked by sound mental experiment beforehand. The data of an echo time pattern 9 and the image separation chart 4 are inputted from the echo time pattern calculation means 8, and the normal position probability 15 is outputted.

[0011] By the way, drawing 13 shows an example of an image separation chart. An image separation chart is a chart called for by sound mental experiment, in drawing 13, an axis of abscissa expresses the time difference between a precedence sound and a consecutiveness sound, the axis of ordinate expresses the difference of sound pressure level between a precedence sound and a consecutiveness sound, and the slash in a chart expresses the relation of the percentage which the time difference, the difference of sound pressure level, and the image between a precedence sound in case the musical-sound source is a speech, and a consecutiveness sound separate. And by applying this chart to the information on the time difference and difference of sound pressure level between a precedence sound and a consecutiveness sound, it can ask for the percentage which an image separates and an image normal position probability can be searched for by subtracting the percentage which an image distributes from 100%.

[0012] And the normal position effectiveness distribution map in a seat for audience is displayed by the normal position probability-distribution display means 16 based on the output of this normal position effectiveness calculation means 1.

[0013] Next, the actuation is explained using drawing 1 .

[0014] First, the sound reception point distribution generation means 2 generates the seat-for-audience area internal division blanket-like sound reception point data 3 of sound field, and the echo time pattern 9 as which the normal position parameter 5 in each [these] sound reception point was considered by the echo time pattern calculation means 8 from the normal position parameter 5, the loudspeaker data 6, and the ** form data 7 is computed.

[0015] Next, while the precedence sound detection means 10 detects a precedence sound, a precedence sound judges whether it is a sound from a normal position loudspeaker. After the consecutiveness sound detection means 11 detects a consecutiveness sound, with the level difference calculation means 12 the level difference between a precedence sound and a consecutiveness sound The time difference between a precedence sound and a consecutiveness sound is computed with the time difference calculation means 13. The normal position probability 15 in each sound reception point orientated without an image's separating into the information on time difference and a level difference in the direction of a normal position loudspeaker with the normal position probability calculation means 14 with the application of the image separation chart 4 for which it asked by sound mental experiment beforehand is computed. Furthermore, the seat-for-audience internal division cloth of a normal position probability is displayed as a normal position effectiveness distribution map with the normal position probability-distribution display means 16 using the value of the normal position probability computed in the shape of distribution in the seat-for-audience area of sound field.

[0016] Thus, it quantifies by the probability orientated with the normal position effectiveness distribution map in the seat for audience computed without an image's separating the effectiveness of the image normal position in the direction of a normal position loudspeaker, and the effectiveness of the normal position in a

seat for audience can be predicted now by the design stage of an image normal position system.

[0017] Drawing 2 is the outline block diagram showing the 2nd example of this invention, and a normal position effectiveness calculation means by which 21 used the 1st consecutiveness sound, and 22 show the 1st consecutiveness sound detection means. In addition, the same sign was attached about the means in the 1st example shown in drawing 1 , data, and what is the same as that of an output, and detailed explanation was omitted.

[0018] The normal position effectiveness calculation means 21 using the 1st consecutiveness sound A precedence sound detection means 10 by which a precedence sound judges whether it is a sound from a normal position loudspeaker while detecting a precedence sound, A 1st consecutiveness sound detection means 22 to detect the 1st consecutiveness sound following a precedence sound, and a level difference calculation means 12 to compute the level difference between a precedence sound and a consecutiveness sound, It consists of normal position probability calculation means 14 to compute the probability orientated without an image's separating into the information on a time difference calculation means 13 to compute the time difference between a precedence sound and a consecutiveness sound, and time difference and a level difference, in the direction of a normal position loudspeaker with the application of the image separation chart for which it asked by sound mental experiment beforehand.

[0019] And the normal position effectiveness distribution map in a seat for audience is displayed by the normal position probability-distribution display means 16 based on the value of the normal position probability 15 in each sound reception point which is the output of the normal position effectiveness calculation means 21 using the 1st consecutiveness sound.

[0020] Next, the actuation is explained using drawing 2 .

[0021] First, the sound reception point distribution generation means 2 generates the seat-for-audience area internal division blanket-like sound reception-point data 3 of sound field, and the echo time pattern 9 as which the normal position parameter 5 in each [these] sound reception point was considered by the echo time pattern calculation means 8 from the normal position parameter 5, the loudspeaker data 6, and the ** form data 7 is computed.

[0022] Next, while the precedence sound detection means 10 detects a precedence sound, a precedence sound judges whether it is a sound from a normal position loudspeaker. After detecting the 1st consecutiveness sound which follows a precedence sound with the 1st consecutiveness sound detection means 22 at coincidence, Compute the level difference between a precedence sound and a consecutiveness sound with the level difference calculation means 12, and the time difference between a precedence sound and a consecutiveness sound is computed with the time difference calculation means 13. The normal position probability 15 in each sound reception point orientated without an image's separating into the information on time difference and a level difference in the direction of a normal position loudspeaker with the normal position probability calculation means 14 with the application of the image separation chart 4 for which it asked by sound mental experiment beforehand is computed. Furthermore, the seat-for-audience internal division cloth of a normal position probability is displayed as a normal position effectiveness distribution map with the normal position probability-distribution display means 16 using the value of the normal position probability 15 computed in the shape of distribution in the seat-for-audience area of sound field.

[0023] Thus, it quantifies by the probability orientated with the normal position effectiveness distribution map in the seat for audience computed without an image's separating the effectiveness of the image normal position in the direction of a normal position loudspeaker, and the effectiveness of the normal position in a seat for audience can be predicted by the design stage of an image normal position system comparatively simple.

[0024] Drawing 3 is the outline block diagram showing the 3rd example of this invention, a normal position effectiveness calculation means by which 31 used the consecutiveness sound of the maximum level, and 32 show a consecutiveness sound level detection means, and 33 shows the consecutiveness sound detection

means of the maximum level. In addition, the same sign was attached about the means in the 1st example shown in drawing 1 , data, and what is the same as that of an output, and detailed explanation was omitted.
[0025] The normal position effectiveness calculation means 31 using the consecutiveness sound of the maximum level A precedence sound detection means 10 by which a precedence sound judges whether it is a sound from a normal position loudspeaker while detecting a precedence sound, A consecutiveness sound level detection means 32 to detect the level of a consecutiveness sound, and a consecutiveness sound detection means 33 of the maximum level to detect the consecutiveness sound of the biggest level, A level difference calculation means 12 to compute the level difference between a precedence sound and the detected consecutiveness sound, It consists of normal position probability calculation means 14 to compute the probability orientated without an image's separating into the information on a time difference calculation means 13 to compute the time difference between a precedence sound and a consecutiveness sound, and time difference and a level difference, in the direction of a normal position loudspeaker with the application of the image separation chart for which it asked by sound mental experiment beforehand.
[0026] And the normal position effectiveness distribution map in a seat for audience is displayed by the normal position probability-distribution display means 16 based on the output of the normal position effectiveness calculation means 31 using the consecutiveness sound of the maximum level.
[0027] Next, the actuation is explained using drawing 3 .
[0028] First, the echo time pattern 9 as which the normal position parameter 5 in each sound reception point was considered by the echo time pattern calculation means 8 is computed like the 1st example. Next, while the precedence sound detection means 10 detects a precedence sound, a precedence sound judges whether it is a sound from a normal position loudspeaker. The consecutiveness sound level detection means 32 detects the level of a consecutiveness sound to coincidence, and the consecutiveness sound detection means 33 of the maximum level detects the consecutiveness sound of the biggest level. With the level difference calculation means 12, the level difference between this consecutiveness sound and a precedence sound The time difference between a precedence sound and a consecutiveness sound is computed with the time difference calculation means 13. The normal position probability 15 in each sound reception point orientated without an image's separating into the information on time difference and a level difference in the direction of a normal position loudspeaker with the normal position probability calculation means 14 with the application of the image separation chart 4 for which it asked by sound mental experiment beforehand is computed. Furthermore, the seat-for-audience internal division cloth of a normal position probability is displayed as a normal position effectiveness distribution map with the normal position probability-distribution display means 16 using the value of the normal position probability 15 computed in the shape of distribution in the seat-for-audience area of sound field.
[0029] Thus, it quantifies by the probability orientated with the normal position effectiveness distribution map in the seat for audience computed without an image's separating the effectiveness of the image normal position in the direction of a normal position loudspeaker, and the effectiveness of the normal position in a seat for audience can be predicted by the design stage of an image normal position system.
[0030] Drawing 4 is the outline block diagram showing the 4th example of this invention, and a normal position effectiveness calculation means by which 41 used time window inner product part level for consecutiveness sound level, the time window setting means as opposed to a consecutiveness sound in 42, and 43 show the consecutiveness sound level integral means in a time window. In addition, the same sign was attached about the means in the 1st example shown in drawing 1 , data, and what is the same as that of an output, and detailed explanation was omitted.
[0031] A normal position effectiveness calculation means 41 by which time window inner product part level was used for consecutiveness sound level A precedence sound detection means 10 by which a precedence sound judges whether it is a sound from a normal position loudspeaker while detecting a precedence sound, A consecutiveness sound detection means 11 to detect a consecutiveness sound, and the time window setting

means 42 against the consecutiveness sound which sets up the time window of a certain time amount width of face to a consecutiveness sound, A consecutiveness sound level integral means 43 in a time window to integrate with and ask for the synthetic level of the sound in the time window, A level difference calculation means 12 to compute the level difference between the time window inner product part level of a precedence sound and a consecutiveness sound, A time difference calculation means 13 to compute the time difference between a precedence sound and the set-up time window, It consists of normal position probability calculation means 14 to compute the probability orientated without an image's separating into the information on time difference and a level difference in the direction of a normal position loudspeaker with the application of the image separation chart for which it asked by sound mental experiment beforehand.

[0032] And based on the output of a normal position effectiveness calculation means 41 by which time window inner product part level was used for consecutiveness sound level, with the normal position probability-distribution display means 16, the normal position effectiveness distribution map in a seat for audience is displayed, and the effectiveness of the normal position in a seat for audience can be predicted.

[0033] Next, the actuation is explained using drawing 4 .

[0034] First, the echo time pattern 9 as which the normal position parameter in each [these] sound reception point was considered by the echo time pattern calculation means 8 is computed like the 1st example. Next, while the precedence sound detection means 10 detects a precedence sound, a precedence sound judges whether it is a sound from a normal position loudspeaker. After the consecutiveness sound detection means 11 detects a consecutiveness sound, the time window of a certain time amount width of face is set up to a consecutiveness sound with the time window setting means 42 against a consecutiveness sound. It asks for the integral level of the sound in the time window with the consecutiveness sound level integral means 43 in a time window. The level difference between the time window inner product part level of a precedence sound and a consecutiveness sound is computed with the level difference calculation means 12. The time difference between the time windows set up with the precedence sound with the time difference calculation means 13 is computed. The normal position probability 15 in each sound reception point orientated without an image's separating into the information on time difference and a level difference in the direction of a normal position loudspeaker with the normal position probability calculation means 14 with the application of the image separation chart 4 for which it asked by sound mental experiment beforehand is computed.

[0035] Furthermore, the seat-for-audience internal division cloth of a normal position probability is displayed as a normal position effectiveness distribution map with the normal position probability-distribution display means 16 using the value of the normal position probability 15 computed in the shape of distribution in the seat-for-audience area of sound field. ·

[0036] Thus, it quantifies by the probability orientated with the normal position effectiveness distribution map in the seat for audience computed without an image's separating the effectiveness of the image normal position in the direction of a normal position loudspeaker, and the effectiveness of the normal position in a seat for audience can be predicted by the design stage of an image normal position system.

[0037] Drawing 5 is the outline block diagram showing the 5th example of this invention, and the level difference calculation means as opposed to [as opposed to / in a normal position effectiveness calculation means by which 51 uses the combination of a precedence sound and a total consecutiveness sound, and 52 / a precedence sound-all consecutiveness sound combination means] a total combination in 53, the time difference calculation means as opposed to a total combination in 54, and 55 show a normal position probability minimum value detection means. In addition, the same sign was attached about the means in the 1st example shown in drawing 1 , data, and what is the same as that of an output, and detailed explanation was omitted.

[0038] The normal position effectiveness calculation means 51 using the combination of a precedence sound and a total consecutiveness sound A precedence sound detection means 10 by which a precedence sound judges whether it is a sound from a normal position loudspeaker while detecting a precedence sound, A

consecutiveness sound detection means 11 to detect a consecutiveness sound, and the precedence sound-all consecutiveness sound combination means 52 which combines a precedence sound and a total consecutiveness sound with 1 to 1, respectively, The level difference calculation means 53 against a total combination which computes a level difference about all combination each of a precedence sound and consecutiveness sounds, The time difference calculation means 54 against a total combination which computes time difference about all combination each of a precedence sound and consecutiveness sounds, A normal position probability calculation means 14 to compute the probability orientated without an image's separating into the information on the time difference about a total combination acquired by it, and a level difference in the direction of a normal position loudspeaker with the application of the image separation chart for which it asked by sound mental experiment beforehand, It consists of normal position probability minimum value detection means 55 against a total combination which detects the minimum value, i.e., the value by the side of insurance, out of the normal position probability over a total combination.

[0039] And the normal position effectiveness distribution map in a seat for audience is displayed as an output of the normal position probability-distribution display means 16 based on ****** of the normal position effectiveness calculation means 51 using the combination of a precedence sound and a total consecutiveness sound.

[0040] Next, the actuation is explained using drawing 5 .

[0041] First, the echo time pattern 9 as which the normal position parameter in each [these] sound reception point was considered by the echo time pattern calculation means 8 is computed like the 1st example. Next, while the precedence sound detection means 10 detects a precedence sound, a precedence sound judges whether it is a sound from a normal position loudspeaker. After the consecutiveness sound detection means 11 detects a consecutiveness sound, a precedence sound and a total consecutiveness sound are combined with 1 to 1 with the precedence sound-all consecutiveness sound combination means 52, respectively. A level difference is computed about all combination each of a precedence sound and consecutiveness sounds with the level difference calculation means 53 against a total combination, and time difference is computed about all combination each of a precedence sound and consecutiveness sounds with the time difference calculation means 54 against a total combination. And after computing the probability orientated without an image's separating into the information on the time difference about a total combination acquired by them, and a level difference in the direction of a normal position loudspeaker with the normal position probability calculation means 14 with the application of the image separation chart 4 for which it asked by sound mental experiment beforehand, The normal position probability 15 in each sound reception point orientated without an image's dissociating in the direction of a normal position loudspeaker by detecting the minimum value, i.e., the value by the side of insurance, with the normal position probability minimum value detection means 55 out of the normal position probability over a total combination is computed.

[0042] Furthermore, the seat-for-audience internal division cloth of a normal position probability is displayed as a normal position effectiveness distribution map with the normal position probability-distribution display means 16 using the value of the normal position probability computed in the shape of distribution in the seat-for-audience area of sound field.

[0043] Thus, it quantifies by the probability orientated with the normal position effectiveness distribution map in the seat for audience computed without an image's separating the effectiveness of the image normal position in the direction of a normal position loudspeaker, and the effectiveness of the normal position in a seat for audience can be predicted by the design stage of an image normal position system.

[0044] Drawing 6 is the outline block diagram showing the 6th example of this invention. In drawing 6 , the normal position effectiveness calculation means using the combination of the acoustic wave by which 61 adjoins each other in time, and 62 show the combination means of the acoustic wave which adjoins each other in time. In addition, the same sign was attached about the means in the 1st example shown in drawing 1 , and the 5th example shown in drawing 5 , data, and what is the same as that of an output, and detailed explanation

was omitted.

[0045] The normal position effectiveness calculation means 61 using the combination of the acoustic wave which adjoins each other in time The combination means 62 of the acoustic wave which combines with 1 to 1 the sound which adjoins each other in time, respectively and which adjoins each other in time, The level difference calculation means 53 against a total combination which computes a level difference about combination each of all of them, The time difference calculation means 54 against a total combination which computes time difference about all combination each, A normal position probability calculation means 14 to compute the probability orientated without an image's separating into the information on the time difference about a total combination acquired by it, and a level difference in the direction of a normal position loudspeaker with the application of the image separation chart for which it asked by sound mental experiment beforehand, It consists of normal position probability minimum value detection means 55 against a total combination which detects the minimum value, i.e., the value by the side of insurance, out of the normal position probability over a total combination.

[0046] And the normal position effectiveness distribution map in a seat for audience is displayed by the normal position probability-distribution display means 16 based on the output of the normal position effectiveness calculation means 61 using the combination of the acoustic wave which adjoins each other in time.

[0047] Next, the actuation is explained using drawing 6 .

[0048] First, the echo time pattern 9 as which the normal position parameter in each [these] sound reception point was considered by the echo time pattern calculation means 8 is computed like the 1st example. Next, the sound which adjoins each other in time with the combination means 62 of the acoustic wave which adjoins each other in time is combined with 1 to 1, respectively. A level difference is computed about combination each of all of them with the level difference calculation means 53 against a total combination. Time difference is computed about all combination each with the time difference calculation means 54 against a total combination. The probability orientated without an image's separating into the information on the time difference about a total combination acquired by it and a level difference in the direction of a normal position loudspeaker with the normal position probability calculation means 14 with the application of the image separation chart 4 for which it asked by sound mental experiment beforehand is computed. The normal position probability 15 in each sound reception point is outputted by detecting the minimum value, i.e., the value by the side of insurance, out of the normal position probability over a total combination of the acoustic wave which adjoins each other in time with the normal position probability minimum value detection means 55 against a total combination.

[0049] Furthermore, the seat-for-audience internal division cloth of a normal position probability is displayed as a normal position effectiveness distribution map with the normal position probability-distribution display means 16 using the value of the normal position probability 15 computed in the shape of distribution in the seat-for-audience area of sound field.

[0050] Thus, it quantifies by the probability orientated with the normal position effectiveness distribution map in the seat for audience computed without an image's separating the effectiveness of the image normal position in the direction of a normal position loudspeaker, and the effectiveness of the normal position in a seat for audience can be predicted by the design stage of an image normal position system.

[0051] Drawing 7 is the outline block diagram showing the 7th example of this invention, and the consecutiveness sound detection means as opposed to [as opposed to / in a normal position effectiveness calculation means by which 71 uses the combination of a false precedence sound and the total consecutiveness sound after it, and 72 / the renewal means of a false precedence sound] a false precedence sound in 73, and 74 show the minimum value detection means of the normal position probability over a total false precedence sound. In addition, the same sign was attached about the means in the 1st example shown in drawing 1 , and the 5th example shown in drawing 5 , data, and what is the same as that of an output, and detailed explanation

was omitted.

[0052] The normal position effectiveness calculation means 71 using the combination of a false precedence sound and the total consecutiveness sound after it with the renewal means 72 of a false precedence sound which boils all the computed acoustic waves, receives and carries out renewal of sequential as a false precedence sound in order of time of concentration The consecutiveness sound detection means 73 against the false precedence sound which carries out [sound / to a false precedence sound / consecutiveness] the acoustic wave which reaches later than a false precedence sound whenever it changes a false precedence sound, The precedence sound-all consecutiveness sound combination means 52 which combines a precedence sound and a total consecutiveness sound with 1 to 1, respectively, The level difference calculation means 53 against a total combination which computes a level difference about all combination each of a precedence sound and consecutiveness sounds, The time difference calculation means 54 against a total combination which computes time difference about all combination each of a precedence sound and consecutiveness sounds, A normal position probability calculation means 14 to compute the probability orientated without an image's separating into the information on the time difference about a total combination acquired by it, and a level difference in the direction of a normal position loudspeaker with the application of the image separation chart 4 for which it asked by sound mental experiment beforehand, The normal position probability minimum value detection means 55 against a total combination which detects the minimum value, i.e., the value by the side of insurance, out of the normal position probability over a total combination, It consists of minimum value detection means 74 of the normal position probability over the total false precedence sound which detects the minimum value further out of the normal position probability minimum value to all false precedence sounds.

[0053] And the normal position effectiveness distribution map in a seat for audience is displayed by the normal position probability-distribution display means 16 based on the output of the normal position effectiveness calculation means 71 using the combination of a false precedence sound and the total consecutiveness sound after it.

[0054] Next, the actuation is explained using drawing 7 .

[0055] First, the sound reception point distribution generation means 2 generates the seat-for-audience area internal division blanket-like sound reception point data 3 of sound field, and the echo time pattern 9 as which the normal position parameter in each [these] sound reception point was considered by the echo time pattern calculation means 8 from the normal position parameter 5, the loudspeaker data 6) and the ** form data 7 is computed. Next, renewal of sequential is carried out as a false precedence sound in order of time of concentration with the renewal means 72 of a false precedence sound to all the computed acoustic waves. It will be considered that the acoustic wave which reaches later than a false precedence sound whenever it changes a false precedence sound with the consecutiveness sound detection means 73 against a false precedence sound is a consecutiveness sound to a false precedence sound. A precedence sound and its total consecutiveness sound are combined with 1 to 1 with the precedence sound-all consecutiveness sound combination means 52, respectively. A level difference is computed about all combination each of a precedence sound and consecutiveness sounds with the level difference calculation means 53 against a total combination. Time difference is computed about all combination each of a precedence sound and consecutiveness sounds with the time difference calculation means 54 against a total combination. The probability orientated without an image's separating into the information on the time difference about a total combination acquired by it and a level difference in the direction of a normal position loudspeaker with the normal position probability calculation means 14 with the application of the image separation chart 4 for which it asked by sound mental experiment beforehand is computed.

[0056] And by the normal position probability minimum value detection means 55 against a total combination, the minimum value, i.e., the value by the side of insurance, is detected out of the normal position probability over a total combination, the minimum value detection means 74 of the normal position probability over a total false precedence sound detects the minimum value further out of the normal position

probability minimum value to all false precedence sounds, and the normal position probability 15 in each sound reception point is outputted. Moreover, the seat-for-audience internal division cloth of a normal position probability is displayed as a normal position effectiveness distribution map with the normal position probability-distribution display means 16 using the value of the normal position probability computed in the shape of distribution in the seat-for-audience area of sound field.

[0057] Thus, it quantifies by the probability orientated with the normal position effectiveness distribution map in the seat for audience computed without an image's separating the effectiveness of the image normal position in the direction of a normal position loudspeaker, and the effectiveness of the normal position in a seat for audience can be predicted by the design stage of an image normal position system.

[0058] Drawing 8 is the outline block diagram showing the 8th example of this invention, 81 shows the conversion means from a normal position probability to a color, and, as for 82, at least seat-for-audience private decision shows a probability-distribution color area map display means. In addition, the same sign was attached about the means in the 1st example shown in drawing 1 , data, and what is the same as that of an output, and detailed explanation was omitted.

[0059] At least the seat-for-audience private decision which displays the normal position probability-distribution display means 16 as the conversion means 81 from the normal position probability which maps the difference in the acquired normal position probability to the difference in a color to a color on a color area map from the normal position probability and color information for every sound reception point which is the output consists of probability-distribution color area map display means 82. And this normal position probability-distribution display means 16 considers as an input the value of the normal position probability 15 in each sound-reception point which is the output of the normal position effectiveness calculation means 1, expresses the difference in the value of the normal position probability computed in the shape of distribution at each sound-reception point by the difference in a color, and displays the normal position effectiveness distribution map in a seat for audience by using distribution of the normal position situation in the seat-for-audience area of sound field as a color area map.

[0060] In addition, any normal position effectiveness calculation means which starts the 7th example from the 1st example may be used for the part of the normal position effectiveness calculation means 1.

[0061] Next, the actuation is explained using drawing 8 and drawing 11.

[0062] First, like the 1st example, the normal position effectiveness calculation means 1 outputs the effectiveness of the normal position at each sound reception point in seat-for-audience area as a normal position probability, and the conversion means 81 from a normal position probability to a color maps the difference in the acquired normal position probability as a difference in a color. As the probability-distribution color area map display means 82 shows at least seat-for-audience private decision to drawing 11 from the normal position probability and color information for every sound reception point which is the output, it indicates by the color area map.

[0063] Thus, the difference in the value of the normal position probability computed in the shape of distribution at each sound reception point can be expressed by the difference in a color, the effectiveness of the normal position in a seat for audience can be beforehand checked by the difference in a color visually in a design stage by indicating the distribution of the normal position situation in the seat-for-audience area of sound field by the color area map, and the effectiveness of the normal position in a seat for audience can be predicted.

[0064] Drawing 9 is the outline block diagram showing the 9th example of this invention, 91 shows a ****** probability contour creation means, and, as for 92, at least seat-for-audience private decision shows a probability-distribution contour display means. In addition, the same sign was attached about the means in the 1st example shown in drawing 1 , data, and what is the same as that of an output, and detailed explanation was omitted.

[0065] the value of the normal position probability for the normal position probability-distribution display

means 16 to have been acquired at each sound reception point -- using -- etc. -- at least the normal position probability contour creation means 91, such as creating a normal position probability contour, and the seat-for-audience private decision which indicates the normal position probability distribution by the contour using this contour information consist of probability-distribution contour display means 92.

[0066] And it is characterized by indicating the distribution of the normal position situation in the seat-for-audience area of sound field by the contour by considering the value of the normal position probability 15 in each sound reception point which is the output of the normal position effectiveness calculation means 1 as an input, and the effectiveness of the normal position in a seat for audience can be beforehand checked with the configuration of a same probability contour visually.

[0067] In addition, any normal position effectiveness calculation means which starts the 7th example from the 1st example may be used for the part of the normal position effectiveness calculation means 1 here.

[0068] Next, the actuation is explained using drawing 9 and drawing 12.

[0069] First, the normal position effectiveness calculation means 1 outputs the effectiveness of the normal position at each sound reception point in seat-for-audience area as a normal position probability like the 1st example. the value of the normal position probability acquired at each sound reception point -- using -- etc. -- a ****** probability contour is created with the normal position probability contour creation means 91, and with the probability-distribution contour display means 92, the normal position probability distribution is indicated by the contour, as at least seat-for-audience private decision is shown in drawing 12 using this contour information.

[0070] Thus, the effectiveness of the normal position in a seat for audience can be beforehand checked with the configuration of a same probability contour visually by indicating the distribution of the normal position situation in the seat-for-audience area of sound field by the contour, and the effectiveness of the normal position in a seat for audience can be predicted.

[0071]

[Effect of the Invention] As mentioned above, according to explained this invention, first, a sound reception point is set up in the shape of distribution in the seat-for-audience area of sound field with a sound reception point distribution generation means, and the echo time pattern as which the normal position parameter in each [these] sound reception point was considered by the echo time pattern calculation means from a normal position parameter, loudspeaker data, and ** form data is computed. Next, while a precedence sound detection means detects a precedence sound, a precedence sound judges whether it is a sound from a normal position loudspeaker. After a consecutiveness sound detection means detects a consecutiveness sound, with a level difference calculation means the level difference between a precedence sound and a consecutiveness sound The time difference between a precedence sound and a consecutiveness sound is computed with a time difference calculation means, and the probability orientated without an image's dissociating in the direction of a normal position loudspeaker with a normal position probability calculation means with the application of the image separation chart for which the information on time difference and a level difference was beforehand asked by sound mental experiment is computed. Furthermore, the effectiveness of the normal position in a seat for audience can be predicted by indicating a color area map display or the ****** probability curve for distribution of a normal position probability by the contour with a normal position probability-distribution display means using the value of the normal position probability computed in the shape of distribution in the seat-for-audience area of sound field.

[Translation done.]

EFFECT OF THE INVENTION

[Effect of the Invention] As mentioned above, according to explained this invention, first, a sound reception point is set up in the shape of distribution in the seat-for-audience area of sound field with a sound reception point distribution generation means, and the echo time pattern as which the normal position parameter in each [these] sound reception point was considered by the echo time pattern calculation means from a normal position parameter, loudspeaker data, and ** form data is computed. Next, it is while a precedence sound detection means detects a precedence sound. After a precedence sound judges whether it is a sound from a normal position loudspeaker and detects a consecutiveness sound with a consecutiveness sound detection means, Compute the level difference between a precedence sound and a consecutiveness sound with a level difference calculation means, and the time difference between a precedence sound and a consecutiveness sound is computed with a time difference calculation means. The probability orientated without an image's separating into the information on time difference and a level difference in the direction of a normal position loudspeaker with a normal position probability calculation means with the application of the image separation chart for which it asked by sound mental experiment beforehand is computed. Furthermore, the effectiveness of the normal position in a seat for audience can be predicted by indicating a color area map display or the ****** probability curve for distribution of a normal position probability by the contour with a normal position probability-distribution display means using the value of the normal position probability computed in the shape of distribution in the seat-for-audience area of sound field.

[Translation done.]

:   4 i 1 j   g j cgi i   a _ e _cgi_ejje   7 8 04

OPERATION

[Function] Therefore, a sound reception point distribution generation means to set up a sound reception point in the shape of distribution in the seat-for-audience area of sound field according to this invention, An echo time pattern calculation means to compute the echo time pattern with which said normal position parameter in each sound reception point was taken into consideration based on a normal position parameter, loudspeaker data, and ** form data, A precedence sound detection means by which a precedence sound judges whether it is a sound from a normal position loudspeaker while detecting a precedence sound, A consecutiveness sound detection means to detect a consecutiveness sound, and a level difference calculation means to compute the level difference between a precedence sound and a consecutiveness sound, A normal position probability calculation means to compute the probability orientated without an image's separating into the information on the level difference of a time difference calculation means to compute the time difference between a precedence sound and a consecutiveness sound, and time difference, in the direction of a normal position loudspeaker with the application of the image separation chart for which it asked by sound mental experiment beforehand, It has a normal position probability-distribution display means to display distribution of a normal position probability using the value of the normal position probability computed in the shape of distribution in the seat-for-audience area of sound field, and the effectiveness of the normal position in a seat for audience can predict a color area map display or a ****** probability curve by indicating by the contour.

[Translation done.]

* NOTICES *

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the outline block diagram showing the image normal position simulation equipment of the 1st example of this invention.
[Drawing 2] It is the outline block diagram showing the image normal position simulation equipment of the 2nd example of this invention.
[Drawing 3] It is the outline block diagram showing the image normal position simulation equipment of the 3rd example of this invention.
[Drawing 4] It is the outline block diagram showing the image normal position simulation equipment of the 4th example of this invention.
[Drawing 5] It is the outline block diagram showing the image normal position simulation equipment of the 5th example of this invention.
[Drawing 6] It is the outline block diagram showing the image normal position simulation equipment of the 6th example of this invention.
[Drawing 7] It is the outline block diagram showing the image normal position simulation equipment of the . 7th example of this invention.
[Drawing 8] It is the outline block diagram showing the image normal position simulation equipment of the 8th example of this invention.
[Drawing 9] It is the outline block diagram showing the image normal position simulation equipment of the 9th example of this invention.
[Drawing 10] It is the outline block diagram showing conventional image normal position simulation equipment.
[Drawing 11] It is the example of a color area map display of normal position probability distribution. \
[Drawing 12] It is the example of a contour display of normal position probability distribution.
[Drawing 13] It is the image separation chart used in order to search for an image normal position probability.

[Description of Notations]
1, 21, 31, 41, 51, 61, 71 -- The normal position effectiveness calculation means 2 -- Sound reception point distribution generation means, 3 -- Seat-for-audience area internal division blanket-like sound reception point data 4 -- Image separation chart, 5,101 -- Normal position parameter 6,102 -- Loudspeaker data, 7,103 -- Room form data 8,104 -- Echo time pattern calculation means, [11 73 -- Consecutiveness sound detection means,] 9,105 -- An echo time pattern, 10 -- Precedence sound detection means 12 53 -- Level difference calculation means 13 54 -- Time difference calculation means, 14 -- Normal position probability calculation means 15 -- Normal position probability in each sound reception point 16 -- Normal position probability-distribution display means, 17 -- The normal position effectiveness distribution map in a seat for audience 22 -- The 1st consecutiveness sound detection means, 32 -- Consecutiveness sound level detection means 33 --

The consecutiveness sound detection means of the maximum level, 42 -- Time window setting means 43 -- The consecutiveness sound level integral means in a time window, 52 -- Precedence sound-all consecutiveness sound combination means 55 74 -- Normal position probability minimum value detection means, 62 -- Combination means 72 -- The renewal means of a false precedence sound, and 81 -- Conversion means, 82 -- At least seat-for-audience private decision is a probability-distribution color area map display means. Normal position probability contour creation means, such as 91 -- 92 [107 -- Judgment result.] -- At least seat-for-audience private decision is a probability-distribution contour display means and 106. -- Precedence sound loudspeaker judging means

---

[Translation done.]